

# NCSP CSSG Tasking 2016-01 Response Report

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## Review of T&EP Classroom and Hands-On Course for NCS Professionals

15 March 2016



### CSSG Subgroup Team Members:

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# CSSG Tasking 2016-01 Statement Goals/Metrics

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❧ Goals – Review US DOE NCSP T&EP Classroom and Hands-on Course (HTEC) at

- ❧ NFO Classroom (Hopper/Brady Raap)
- ❧ NCERC Hands-on (Brady Raap/Kimball)
- ❧ SCX Hands-on (Hopper/Trumble)

for

❧ Metrics – Effectiveness of presentations and balance of course materials and content as measured against

- ❧ Recommendations of US DOE NCSP CSSG Tasking 2009-03 Recommendations
- ❧ 2014 – 2023 NCSP Mission and Vision
- ❧ Circumstances that are, or may reasonably become, prevalent regarding necessary resources to address the course criteria (e.g., availability of facilities, training materials, personnel, fiscal support, calendar dates, student support/schedules)

**Review of  
Hands-on Training & Education Course (HTEC)  
Consistency  
with  
CSSG Tasking 2009-03  
CONSIDERATIONS and RECOMMENDATIONS**



# HTEC Consistency with CSSG Tasking 2009-03 CONSIDERATIONS



- ❧ Top Priority - Provide a hands-on training experience addressing important characteristics of neutron multiplying systems, along with discussion of the theory and implications for safety of fissionable material operations
- ❧ Second Priority - Provide a consistent level of understanding and awareness:
  - ❧ • application of rules, standards, and guides,
  - ❧ • performance of criticality safety evaluations, and
  - ❧ • hazards analysis methods and implementation/maintenance of NCS controls
- ❧ Third Priority - Provide training in interpretation of data (NCS handbooks, experimental data), computational methods (hand calculations, NCS codes), and other "tools of the trade" for criticality safety engineers. Also, provide training regarding issues associated with criticality accident alarm systems and emergency preparedness.

# Observations about CSSG Tasking 2009-03 RECOMMENDATIONS

## Classroom Training (NFO)



- ❧ The training appears to be effective as demonstrated by student feedback to the reviewers but it lacks the formality of training methods.
- ❧ There is little evidence of collaboration (NFO/NCERC/SCX) on training content.
- ❧ The instructors come from diverse intellectual, academic and experiential backgrounds.
- ❧ Though specified in the 2-Week Nuclear Criticality Safety Hands-On Training Course Student Information Booklet, there is no strong evidence that attendees actually familiarized themselves with the prerequisites.
- ❧ NFO had no operating or mockup facility. Heavy reliance was placed upon verbal descriptions leaving students with limited appreciation for operating constraints/flexibilities.

# High Level Observations *resulting from* CSSG Tasking 2016-01



## GENERAL High Level Observations



- ❧ The Review Team Members unanimously concur that the NCSP T&EP provides significant value to students regarding course content and interactions.
- ❧ The T&EP team has worked hard to encompass the guidance provided in the CSSG 2009-03 response and to meet a number of the 5-year mission goals as well as to accommodate changes to a new venue having no operating facility for walk downs.
- ❧ There was limited course creep, however there were opinions/site positions presented as if they were “gospel”.

## GENERAL High Level Observations



- ❧ As presented in the slides, the Ground Rules metrics for pass/fail were not consistent across the three portions of the course.
- ❧ The course could be substantially improved by tying the classroom and experimental portions more closely to the parameter impact on criticality systems in relation to “on-the floor” criticality safety.



## NFO High Level Observations



- ❧ The classroom/facility space available at the NFO location was excellent. From a facility standpoint only the issue of audio/visual equipment and support were noted as negatives.
- ❧ The loss of an operating facility walk down provided much more in-classroom time that seemed to inflate some of the presentations creating a perceived imbalance in information presented.
- ❧ The process analysis portion of the course was stunted from not having access to an operating facility (e.g., LANL PF-4) for the Nuclear Criticality Safety Evaluation (NCSE) Workshops and Process Analyses.
- ❧ There were instances of slide content/words not being consistent with ANSI/ANS-8.XX language.
- ❧ No review of anomalies were addressed [essentially none].

## NFO High Level Observations – *Recommendations*



- ❧ Some mixed messaging with respect to using a systematic approach to performing evaluations. Steps are presented in lecture materials and NCSET modules but not carried through to exercises.
- ❧ Various definitions and the statement made on the treatment of “positive bias” are not consistent with ANSI/ANS-8.24 – 2007.
- ❧ Training in hazards analysis was weak and was mostly “What If”.
- ❧ Much of the provided information, data, and graphics is plutonium-centric.
- ❧ Training on accident alarm systems and emergency preparedness were not included.

## SCX High Level Observations – *Recommendations*



- ❧ Significant reduction in background noise has resulted from the HVAC upgrade.
- ❧ Instructors projected a passion for the material and a genuine interest in the students. This kept the students engaged throughout the week.
- ❧ All materials necessary for the students to perform the experiments, data collection and evaluation were provided to the students in the classroom.
- ❧ Some modules (modules 23-25) were of very limited value. These were focused on LWR reactor cores, and while interesting, the time in the class room could be more effectively utilized by covering other material.
- ❧ Some discussions about the implications of experiments and lattice criticality accidents regarding the safety of DOE fissionable material operations were weak with a focus on reactor lattices as opposed to the experiment accidents' similarity to non-reactor nuclear facility fissionable material operations.

## NCERC High Level Observations



- ❧ The logistics of entry/exit to DAF, escorts, rad con, etc. worked smoothly. Training rooms were well equipped and comfortable.
- ❧ The conduct of the experiments was professionally done and the information is of significant value in training nuclear criticality safety engineers.
- ❧ Tie back the process analysis methods to the experiment portion of the training to reinforce the classroom portion.
- ❧ The conduct of the hands on portion for TACS Modules 3 & 4 were more informal, with limited explanation, than the Planet, Flattop and Godiva-IV Modules 5, 7, and 8 respectively.
- ❧ Many questions asked by instructors were yes/no type questions or questions that hinted as to the answer or were quick to confirm an answer by a student.



## NCERC High Level Observations



- ❧ There was a tendency to “staff” positions by the instructors where students could do the job (e.g., reading through the procedure, overseeing calculation results or otherwise doing the work for the student).
- ❧ A significant amount of time was spent on teaching experimental methods, including the attempt to distinguish an operation from ANS-8.1 space to ANS-1 space. This was at times confusing.
- ❧ There was a missed opportunity during the Flattop Free-Run demonstration to promote the concept of critical thinking to encourage a questioning attitude and to challenge the concept of using the “most conservative” conditions.

# High Level Goals – *Observations*

## 2014-2023 NCSP Mission and Vision Goals



# 2014-2023 NCSP Mission and Vision Goals

## High Level Goals– *Observations*



✧ A sustainable process to identify and communicate available training classes and education resources in the national and international communities.

*This is being accomplished by the continued and updated postings on the US DOE NCSP website regarding the announcement of the T&E HTEC for professional nuclear criticality safety engineers (NCSE). Other training courses regarding the development and use computer codes are publicized via the NCSP sponsored ORNL Radiation Safety Information Computational Center as well as Nuclear Criticality Safety Engineer Training modules. As noted there is a further opportunity to integrate the HTEC with the other materials on the NCSP website.*

# 2014-2023 NCSP Mission and Vision Goals

## High Level Goals– *Observations*



- ∞ A gap analysis of training needs based on an assessment of available training and education resources in the national and international communities.

*This is being addressed by the current CSSG review of the extant US DOE NCSP T&E Program regarding the HTEC program.*

- ∞ A sustainable process to obtain and incorporate feedback to expand or improve training course(s), training modules, or NCSET modules.

*This is being addressed by student evaluation forms from each class and feedback of the CSSG Tasking 2016-01 Response review of the extant US DOE NCSP T&E Program. Those data should be reviewed annually for trends that could identify needed clarifications on messaging.*



# 2014-2023 NCSP Mission and Vision Goals

## High Level Goals– *Observations*



- ❧ The existing and unique training provided by the NCSP, e.g., classroom and hands-on experiment training, and NCSET modules, remains a high priority  
*The CSSG Subgroup Review Team judges that the HTEC is a high priority for the NCSP.*
- ❧ Sustain a training course for managers, supervisors, criticality safety officers, or criticality safety representatives, and DOE facility representatives.  
*Though not examined during this review, it is understood that those courses have not been piloted or reviewed for consistency with NCSP objectives but are on-going.*

# 2014-2023 NCSP Mission and Vision Goals

## High Level Observations – *Recommendations*



- ❧ Develop a mobile CAT 1 criticality hands-on critical or near critical demonstration capability

*The TACS machine is capable of being transported however it is understood that the necessary resources (\$, manpower) are not currently available/prioritized to permit hands-on training at facilities other than NCERC.*

- ❧ Sustainable program (internship, rotational assignments, etc.) to facilitate collaborative training and education opportunities (national and international).

*This goal is in its infancy but has been initiated with a collaborative agreement since 2014 resulting in IRSN personnel visiting SNL, LANL, and NCERC and learning about NCS training and practices in the US. There has been an exchange of an LLNL employee with AWE under a continuing mechanism for exchanges between NNSA and AWE, however it has not yet become a sustainable program.*

# High Level Observations

## Resources to Address Course Criteria



# High Level Observations

## “Resources to Address Course Criteria”



- ❧ The CSSG Subgroup Review Team was unable to fully address the tasking criteria regarding “consider realistic circumstances regarding potential necessary resources to address the course criteria,” however the following were observed:
  - ❧ The training materials and course content were judged to be very good and well put together, and use of students time in the course was good.
  - ❧ The class, and attendance at the classes appears to continue to be strong.
  - ❧ The goal of having a “mobile version” of the class, perhaps using TACS, that could come to the individual sites, has not been realized.
  - ❧ The T&EP has recently lost access to the LANL PF-4 for walk down tours and student familiarity with a fissionable material operating facility which is contrary to the CSSG Tasking 2009 Response Recommendation.
  - ❧ The HTEC classroom content has fairly well stabilized and the use of “alternate” teachers for the class has been undertaken. Since multiple instructors may be used over multiple classes to teach a module, the importance of speakers notes, and speaker preparation is very important.



# See CSSG Tasking 2016-01 Response Report



Regarding

- ❧ The effectiveness of presentations and balance of the course material and content in addition to the appropriateness of any course creep relative to the CSSG Response to Tasking 2009-03: Recommendations for the Future DOE NCSP Training and Education Infrastructure Program
- ❧ The consistency of the course with the 2014-2023 NCSP Mission and Vision
- ❧ The realistic circumstances that are, or may reasonably become, prevalent regarding necessary resources to address the course criteria (e.g., availability of facilities, training materials, personnel, fiscal support, calendar dates, student support/schedule)

**(approximately 300 Observations – *Recommendations*)**

# Questions & Comments

